

Urban Stormwater



Urbanization

- 💧 Urbanization: the development of land, leading to an increase in the amount of impervious surface in the watershed
- 💧 Impervious surface is the sum of all hard surfaces in the watershed
 - 💧 All the surfaces that inhibit infiltration of rainfall



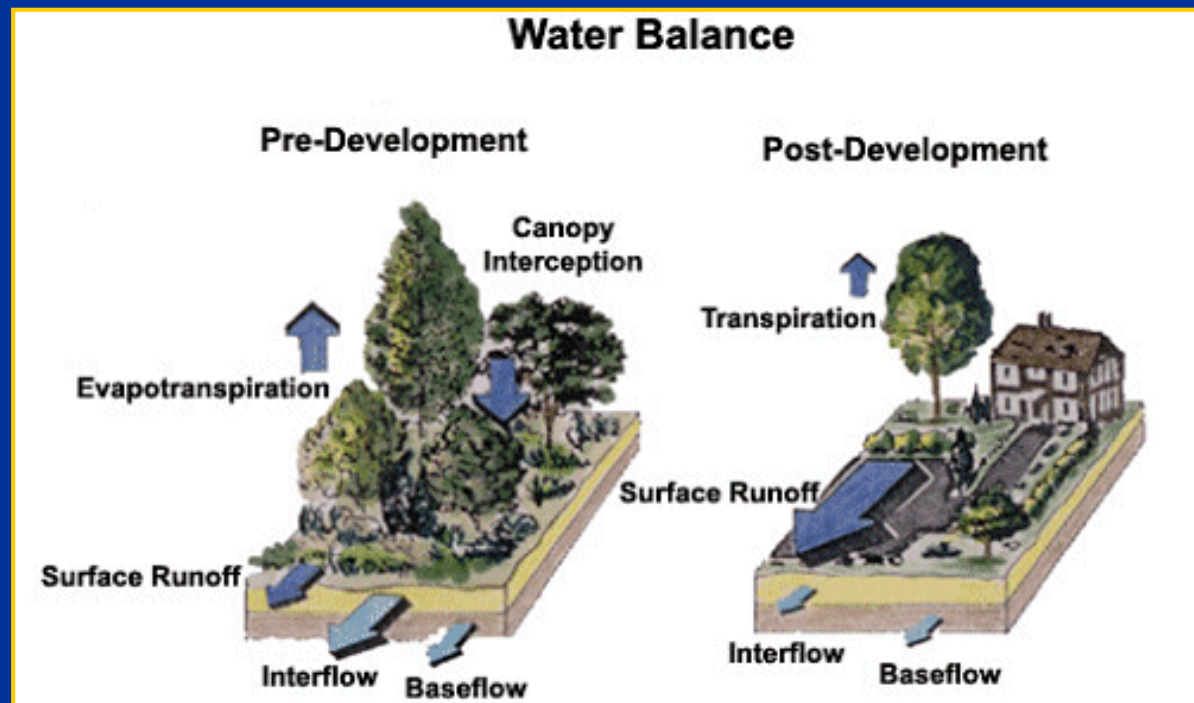
Impacts of Urbanization

- 💧 Increases in impervious surfaces lead to an increase in water quantity delivered to streams, which results in higher energy
- 💧 Land disturbance through development leads to an increase in sediment input and decrease in vegetation



Impacts of Urbanization

Impervious cover disrupts the natural water balance, dramatically increasing water running off the site



Typical Stormwater Management

- 💧 Curbs and gutters are designed to deliver stormwater away from the road surface in a timely and efficient manner.
- 💧 Catch basins or inlets collect stormwater and direct it to a downstream stormwater facility or to receiving waters.

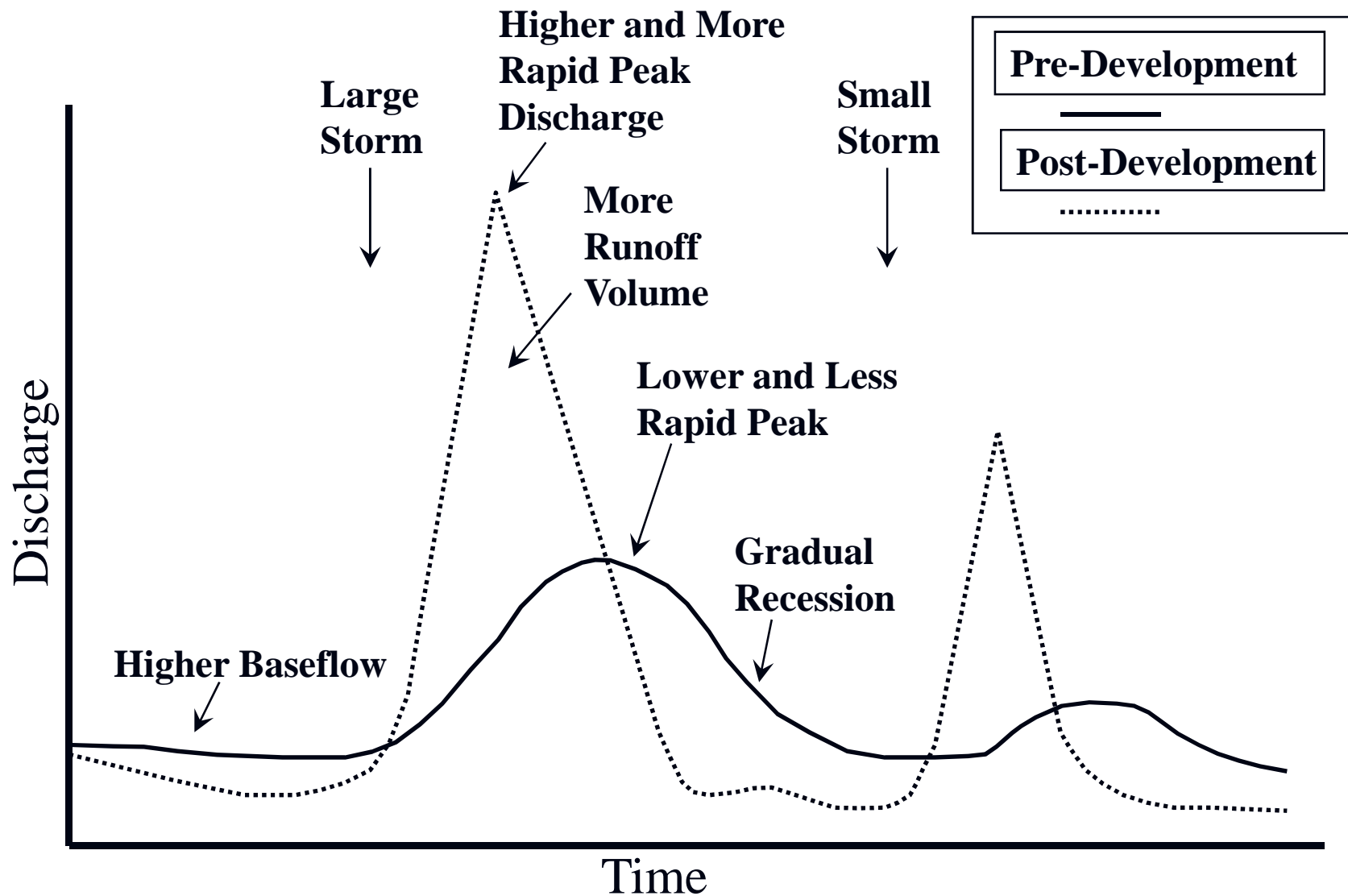


Typical Stormwater Management



Often, the runoff is directly discharged into nearby waterbodies without water quality treatment.

Impacts on Hydrology



Impacts on Hydrology



An increase in stormwater flow can result in flooding and downcutting of the stream.

Impacts on Hydrology



Bankfull flooding occurs more frequently in highly urbanized areas and has the potential to be extremely erosive and damaging to the natural morphology of the stream.

Impacts on Habitat

In many highly urbanized areas, natural streams have been channelized and lined with concrete to quickly guide runoff, but these streams have lost all habitat value.



Impacts on Habitat



< 5% impervious surfaces



10% impervious surfaces

Impacts on Habitat



20% impervious surfaces



30% impervious surfaces

Impacts on Habitat



The surrounding area of this stream is approximately 50% impervious cover. In these situations streams are often piped.

Impacts on Habitat



Culverts like these act as barriers to fish migration and cut off spawning areas.

Impacts on Water Quality



Urbanization causes the temperature of streams to rise, both during low flow and storm events.

Impacts on Water Quality

Research shows that at 10% impervious cover, aquatic insect and fish communities in urban streams begin to decline sharply.

- 💧 Declines in both the total number of aquatic species and number of sensitive species
- 💧 Wetland plants and animals are also adversely impacted by increasing impervious cover.



Stormwater and Sediment



Stormwater and Sediment

Sediment can:

- 💧 Clog gills
- 💧 Bury eggs
- 💧 Smother habitats



Impacts on Stream Channel



Increased sediment input fills in stream channels and decreases invertebrate habitat

Stormwater BMPs

Aquatic buffers



Agricultural riparian buffers



Urban riparian buffers

Stormwater BMPs

Shared drives & pervious pavers



Stormwater BMPs

Partial pervious parking surfaces



Stormwater BMPs

Constructed Wetlands



Stormwater BMPs

Vegetated swales and Bio-retention filtering systems.



Stormwater BMPs

Rain Gardens



Stormwater BMPs

Green Roofs



Watershed Stewardship Programs

Special activities

- 💧 Stream Teams
- 💧 Storm drain stenciling
- 💧 Clean-up days
- 💧 Install a rain barrel
- 💧 Plant a rain garden
- 💧 Grow Native
- 💧 Keep lawns 3" minimum



Economic Benefits

- 💧 Reduces stormwater management costs
- 💧 Saves mowing and maintenance
- 💧 Avoid drainage complaints
- 💧 Increases property values and sales
- 💧 Attracts wildlife



Additional Resources

Center for Watershed Protection:

- 💧 www.cwp.org

Stormwater Manager's Resource Center:

- 💧 www.stormwatercenter.net

Environmental Protection Agency:

- 💧 <http://www.epa.gov/owow/nps/urbanmm/>

- 💧 <http://water.epa.gov/scitech/wastetech/guide/stormwater/>

Low Impact Development Center:

- 💧 www.lowimpactdevelopment.org